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Report to the Chairman, Subcommittee on Courts, Intellectual Property and the Administration of Justice, Committee on the Judiciary, House of Representatives

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TECHNOLOGY TRANSFER

Copyright Law Constrains Commercialization of Some Federal Software

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The Honorable Robert W. Kastenmeier
Chairman, Subcommittee on Courts,
Intellectual Property and the
Administration of Justice
Committee on the Judiciary
House of Representatives

Dear Mr. Chairman:

As requested, this report discusses federal agencies' efforts to comply with the prohibition on copyrighting government works, the extent to which copyright law has constrained the transfer of federal computer software and other new technologies, and the pros and cons of amending copyright law to allow federal agencies to copyright software. The report contains a matter for congressional consideration for stimulating the transfer and use of federal software with commercial applications.

As agreed with your office, we are sending copies of this report to the Director, Office of Management and Budget and other interested parties. Copies will be made available to others upon request.

This report was prepared under the direction of John M. Ols, Jr., Director, Housing and Community Development Issues, who may be contacted at (202) 275-5525. Other major contributors to this report are listed in appendix III.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

Responding to rising concern about the U.S. trade deficit and the ability of U.S. businesses to compete in world markets, the Congress and the administration have acted to strengthen the links between the nation's research and technology base and U.S. industry. Their actions include stimulating the transfer of technology to U.S. businesses from federal government-operated laboratories, which funded about $15.8 billion for research and development (R&D) in fiscal year 1989. However, in a March 1988 report,[1] GAO identified copyright law as a constraint to the transfer of federal computer software to U.S. businesses.

The Chairman, Subcommittee on Courts, Intellectual Property and the Administration of Justice, House Committee on the Judiciary, requested that GAO follow up on this report by examining (1) federal agencies' efforts to comply with the prohibition on copyrighting government works, (2) the extent to which copyright law has constrained the transfer of federal software and other new technologies, and (3) the pros and cons of amending copyright law to allow federal agencies to copyright software.

Background

Copyrights protect literary and artistic expression by giving authors the exclusive right for a limited time to, among other things, reproduce and sell copies of their work. However, under 17 U.S.C. 105, copyright protection is unavailable for any U.S. government work—including publications, computer software, and data bases—and unclassified and nonsensitive software is generally disseminated. Also, the Semiconductor Chip Protection Act of 1984 (P.L. 98-620) provided new protection for "mask" works—patterns used in fabricating integrated circuits on semiconductor chips—but prohibited protection of federal mask works.

Legislation enacted during the past 10 years has stimulated the transfer of technology from federal laboratories to U.S. businesses by authorizing federal agencies to (1) grant nonexclusive, partially exclusive, or exclusive patent licenses, (2) negotiate rights to intellectual property under a cooperative R&D agreement, and (3) give federal inventors generally at least 15 percent of any royalties from licensed inventions. However, this legislation has not facilitated the commercialization of federal software—computer programs and supporting documentation—which currently cannot be copyrighted.

[1]Technology Transfer: Constraints Perceived by Federal Laboratory and Agency Officials (GAO/RCED-88-116BR, Mar. 4, 1988).

To examine the impact of the copyright prohibition, GAO interviewed senior administrators and patent counsels at the Departments of Agriculture, Commerce, Energy, and Defense; the Environmental Protection Agency; the National Aeronautics and Space Administration; and the National Institutes of Health (NIH). In fiscal year 1989, these seven agencies funded about $14.3 billion for R&D at federal government-operated laboratories—about 90 percent of all such funding.

Results in Brief

GAO found no evidence that federal agencies have improperly copyrighted software developed by federal workers. However, senior officials at six of the seven agencies believe their efforts to transfer computer software with potential commercial applications to U.S. businesses have been constrained to a significant but not precisely determinable extent because the government cannot copyright and license software. Officials at four of these agencies stated that a conservative estimate would be that this software represented 10 percent of all the software developed.

Copyright and licensing authorities would stimulate the transfer of federal software with commercial applications to U.S. businesses by providing protection for their investments, according to agency officials and executives from two businesses that have considered commercializing federal software. Royalty-sharing authority also would give federal researchers an incentive to further develop and document the software. However, officials of the Information Industry Association, which represents businesses that distribute information, expressed concern that authority to copyright and license software could limit access to federal scientific and demographic data bases that software provides.

Principal Findings

Federal Agencies' Efforts to Comply With the Copyright Prohibition

GAO found no evidence that federal agencies have improperly copyrighted government software. However, in a few cases, federal software distribution centers have restricted (1) foreign access to the software and/or (2) customers' rights to further disseminate software without the center's permission. Federal laboratories also have provided software to some businesses for further development. However, since this software is not fully developed and documented, the laboratories have not made

it generally available, and it is unclear whether this software would be made available to subsequent requesters.

Copyright Law Constrains Transfer of Certain Federal Software

According to officials at the seven federal agencies GAO reviewed, most software is developed for specific scientific applications and is adequately disseminated. Senior Energy officials said the copyright prohibition has not constrained their transfer efforts because almost all of Energy's research-related software has been developed by its contractor-operated laboratories, which are not directly affected by the copyright prohibition for U.S. government works.

However, senior officials at the other six agencies stated that their inability to copyright software and grant a partially exclusive or exclusive license for it has significantly constrained the transfer and use of software with wider commercial applications. The officials stated that, as with commercializing inventions, further development is needed before the federal software can be marketed, and businesses are unwilling to invest in this software without copyright protection and some guarantee of exclusivity. Executives from two businesses that have considered commercializing federal software stated that their companies would require copyright protection and exclusivity to prevent competitors from marketing alternative software packages that are potentially less developed and less expensive. Agencies' experiences in negotiating cooperative R&D agreements also indicate their difficulties in commercializing software. For example, NIH is negotiating its first agreement that has a major software component after entering into about 130 agreements, and of the 140 agreements that the Agricultural Research Service has signed or is negotiating, none focuses on software.

Only a few federal laboratories conduct R&D involving semiconductor mask works, and agency officials identified no cases in which the transfer of mask works was constrained. Also, NIH officials suggested considering new intellectual property protection that would be faster and less expensive to obtain than currently available patent protection for cells and microorganisms developed through biomedical research.

Pros and Cons of Amending the Copyright Law for Federal Software

According to senior officials at the six agencies concerned about the copyright law, the government should be allowed to copyright and exclusively license software and federal researchers should be able to share in any royalties from licensed software. These authorities would improve the transfer and use of federal software with commercial

applications because businesses could protect their investment and federal researchers would have an incentive to work with businesses in developing and documenting the software. These authorities also (1) would provide federal computer programmers with opportunities for career, financial, and intellectual rewards similar to those provided to federal inventors and (2) could enhance public access to some federal software because the software might not otherwise be sufficiently developed and documented for general dissemination. Several agency and laboratory officials stated that with copyright authority they could better control the quality and distribution of software related to their mission of improving public health and safety.

However, in the view of some federal laboratory managers and researchers, copyrighting and licensing authorities would (1) distract researchers from the laboratory's basic research mission and (2) interfere with informal exchanges among federal and university scientists. In addition, Information Industry Association officials are concerned that agencies might use authority to copyright software to either restrict access or give favored access to federal data bases.

Matters for Consideration by the Congress

To effectively transfer and use federal computer software while accommodating concerns about access to federal data bases and federal laboratories' basic research mission, it may be appropriate to provide copyright and licensing authorities for federal software with wider commercial applications that need further investment to be effectively transferred. This change could be accomplished by amending (1) the copyright law to allow federal agencies to copyright and grant nonexclusive, partially exclusive, or exclusive licenses to software on a case-by-case basis if such protection would stimulate its effective transfer and use or (2) the Federal Technology Transfer Act to authorize agencies to copyright and grant licenses to federal software under a cooperative R&D agreement. Under either option, consideration should be given to extending the Federal Technology Transfer Act's royalty-sharing authority to include federal software. If the copyright law is amended, consideration should be given to instituting procedures like those required for granting patent licenses to ensure fairness.

Agency Comments

GAO discussed the information included in this report with officials from the seven federal agencies, who agreed with the report's technical accuracy. However, at the Subcommittee's request, GAO did not obtain comments on a draft of this report.

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Abbreviations

CFR	Code of Federal Regulations
COSMIC	Computer Software Management and Information Center
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency
GAO	General Accounting Office
NASA	National Aeronautics and Space Administration
NESC	National Energy Software Center
NIH	National Institutes of Health
NTIS	National Technical Information Service
PTO	Patent and Trademark Office
R&D	research and development
U.S.C.	United States Code

Introduction

During the past 10 years, the Congress has passed legislation and the President has issued an executive order to stimulate the transfer of technology from federal laboratories to U.S. businesses and other organizations. The legislation has encouraged businesses to commercialize federal technology by allowing agencies to (1) grant nonexclusive, partially exclusive, or exclusive licenses to patents for federal inventions and (2) collaborate on research and development (R&D). However, the legislation has not addressed federal computer software, which businesses typically protect by copyrighting.

Intellectual Property Protection

The federal government provides protection to individuals and organizations for intellectual property primarily through copyrights, patents, and trademarks.[1] Alternatively, a business can protect technology by treating it as a proprietary trade secret. The purpose of copyrights and patents is to promote the progress of science and useful arts by providing to authors and inventors for limited times the exclusive right to their respective writings and discoveries.

Copyright and Related Protection

The Copyright Office, in the Library of Congress, administers the copyright registration program under Title 17 of the United States Code. A copyright protects original works of authorship fixed in any tangible medium of expression, including literary works, musical works, dramatic works, pantomimes and choreographic works, motion pictures and other audiovisual works, and sound recordings. The author of an original work may, but need not, register the work with the Copyright Office to claim copyright protection. Subject to the limitations in 17 U.S.C. 107 through 118, the copyright owner has the exclusive right to do or authorize certain activities, including (1) reproducing the copyrighted work, (2) preparing derivative works based upon the copyrighted work, and (3) distributing copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, rental, lease, or lending.

A copyright protects the form of expression rather than the subject matter of the work. For example, the description of an invention could be copyrighted as a literary work. However, copyright protection would prevent others only from copying the description but not from writing an alternative description or from making and using the invention.

[1]Ballentine's Law Dictionary defines intellectual property as those property rights resulting from the physical manifestation of original thought.

Effective January 1978, copyright protection for the work of a single, known author is for the author's life plus 50 years. For a work made for hire, including one prepared by an employee within the scope of employment, copyright protection is 75 years from first publication or 100 years from the work's creation, whichever expires first. For a joint work prepared by two or more authors who did not work for hire, copyright protection is for the life of the last surviving author plus 50 years.

The Copyright Office also is responsible for registering claims of protection for mask works under the Semiconductor Chip Protection Act of 1984 (17 U.S.C. 901 et seq.). Mask works are patterns used in fabricating integrated circuits on semiconductor chips. In establishing separate protection for mask works, the act provided that an owner, subject to certain limitations, has the exclusive right to perform or authorize certain activities, including (1) reproducing the mask work by optical, electronic, or any other means and (2) importing or distributing a semiconductor chip product in which the mask work is embodied. A mask work is protected for 10 years after registration or its first commercial exploitation, whichever occurs first. Copyright Office regulations require a mask work owner to deposit identifying material upon registration but allow the owner to block out material it considers a trade secret, provided it is less than 50 percent of the total.

Patent and Trademark Protection

The Patent and Trademark Office (PTO) in the Department of Commerce administers the patent and trademark programs under Title 35 of the United States Code. PTO will issue a patent to any person who invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvements thereof. To determine whether an invention meets these criteria, PTO examines a patent application's claims and "prior art" (prior discoveries) to determine whether the invention is novel, nonobvious, and has utility. This examination takes about 18 months on average, including in many cases an initial rejection of the application to which the applicant may respond by refiling. In granting a patent, the government gives the patent holder the right to exclude others from making, using, or selling the invention for a period of 17 years, subject to the payment of maintenance fees. In return, PTO publishes the specifications and accompanying drawings of the patent upon issuance.

PTO provides trademark protection for any word, name, symbol, or device used to indicate the source or origin of the goods in interstate or foreign commerce and to distinguish them from the goods of others. PTO

similarly issues service marks for use in the sale or advertising of services. Trademark and service mark rights may be used to prevent others from using a confusingly similar mark but not to prevent others from making the same goods or from selling them under a nonconfusing mark.

Protection of Computer Software

Computer software can be copyrighted,[2] and in some instances computer programs included in inventions are patentable. The Computer Software Copyright Act of 1980 (section 10 of P.L. 96-517) extended copyright protection to computer programs, which are defined as sets of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result. This definition does not include data bases or supporting manuals, which can be copyrighted separately. To register a computer program, the Copyright Office requires the author to submit the first 25 and last 25 pages of the program and states the best representation of authorship is a listing of the program in "source code," which enables programmers to read and manipulate the program's instructions. If the computer program is longer than 50 pages, the middle part of the program does not have to be revealed and can, in effect, become a trade secret.

PTO considers computer software to be a mathematical algorithm—a procedure for solving a given type of mathematical problem. PTO does not issue patents for computer software alone because it considers a mathematical algorithm as similar to a law of nature and therefore not falling within one of PTO's four statutory classes of subject matter—process, machine, manufacture, or composition of matter.

In Diamond v. Diehr (450 U.S. 175 (1981)), however, the Supreme Court held that a patentable process for curing rubber did not become unpatentable because of the inclusion of a mathematical algorithm or computer program. Since this decision, PTO has issued patents for inventions that include a computer program, which it defines as a step-by-step procedure to arrive at a given result wherein a computer physically performs one or more of the recited process steps. In its September 5, 1989, Official Gazette, PTO provided the following two-part test for determining whether an application of a mathematical formula to a known structure or process is patentable:

1. Does the claim directly or indirectly recite a mathematical algorithm?

[2]As defined in this report, computer software includes computer programs and related documentation but not separable data bases.

2. Is the algorithm applied in any manner to physical elements or process steps? This test may be made by determining whether the claims without the algorithm is otherwise patentable.

PTO states that the protection offered by patent and copyright statutes are not mutually exclusive. Accordingly, someone could patent a novel and nonobvious computer process and copyright the software for implementing the process. Because PTO does not have a single classification for inventions using computer processes, it does not have statistics on the number of patents issued for these inventions.

Legislation Stimulating Federal Technology Transfer

Beginning in 1980, the Congress passed several laws to increase U.S. industry's access to and use of federally funded technology. This legislation provided greater authority for federal laboratories to license patents for inventions and collaborate with businesses on R&D. In fiscal year 1989, the federal government obligated an estimated $61.9 billion for R&D, including about $15.8 billion at federal government-operated laboratories and about $6.3 billion at federal contractor-operated laboratories.

In 1980 the Congress enacted two laws to stimulate federal technology transfer. The Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3701 et seq.) took a first step to improve the utilization of federal government-operated laboratory technology by directing federal laboratories to establish offices of research and technology applications to disseminate information about federal products, processes, and services. The Patent and Trademark Amendments of 1980 (35 U.S.C. 200 et seq.) encouraged the licensing of federal inventions by authorizing federal agencies to grant nonexclusive, partially exclusive, or exclusive licenses if they determine that it is appropriate to do so and in the public interest. Implementing regulations for federal patent licensing (37 C.F.R. Part 404) further require that agencies announce their intent to grant an exclusive or partially exclusive license in the Federal Register and provide opportunity for filing written objections within a 60-day period.

The Federal Technology Transfer Act of 1986 (P.L. 99-502) amended the Stevenson-Wydler Act in part, by authorizing federal agencies to permit their government-operated laboratories to collaborate on R&D with other organizations including businesses, through a cooperative R&D agreement. The act defines a cooperative R&D agreement as one in which a federal laboratory and its partner(s) contribute resources (except that the government cannot contribute funds in agreements with nonfederal

entities) for a joint R&D project that must be consistent with the laboratory's mission. The definition further states that a cooperative R&D agreement is not a procurement contract or a cooperative agreement as those terms are used in 31 U.S.C. 6303, 6304, and 6305.

Under the Federal Technology Transfer Act, a laboratory can grant a collaborator title or licensing rights to any resulting invention; but if the collaborator takes title to an invention, the government is required to retain a nonexclusive, royalty-free license for its use by or on behalf of the government. The Stevenson-Wydler Act subsequently was amended in 1988 to authorize laboratory directors to determine rights to other intellectual property developed under a cooperative R&D agreement. In 1989 the act was amended to authorize contractor-operated federal laboratories to enter into cooperative R&D agreements.

The Federal Technology Transfer Act also provided incentives for federal employees to promote technology transfer by directing federal agencies to (1) pay an employee inventor at least 15 percent of any royalties or other income received, up to $100,000 per year, for an invention[3] and (2) establish a cash awards program for inventions, innovations, or other outstanding scientific or technological contributions of value to the United States because of their commercial application or contributions to the missions of the agency or government.

In April 1987 the President issued Executive Order 12591, Facilitating Access to Science and Technology. The order implements the Federal Technology Transfer Act by directing the heads of agencies, to the extent permitted by law, to delegate authority to their government-operated federal laboratories to enter into cooperative R&D agreements and license, assign, or waive rights to intellectual property.

Public Dissemination of Federal Computer Software

Since 1895, the law has prohibited the assertion of copyright in a published federal government work. Current copyright law (17 U.S.C. 105) states that copyright protection is not available for any work of the U.S. government,[4] but that the government is not precluded from receiving and holding copyrights transferred to it by assignment, bequest, or

[3]Alternatively, federal agencies may promulgate regulations provided, in part, that the employee inventor(s) receives more than 15 percent of total agency royalties in any given fiscal year.

[4]Copyright law defines a "work of the U.S. government" as a work prepared by an officer or employee of the U.S. government as part of that person's official duties.

otherwise. The legislative history for the Act for the General Revision of the Copyright Law (P.L. 94-553) stated,

> The effect of section 105 is intended to place all works of the United States Government, published or unpublished, in the public domain. This means that the individual Government official or employee who wrote the work could not secure copyright in it or restrain its dissemination by the Government or anyone else...[5]

The only exception to this prohibition is under 15 U.S.C. 290(e), which permits the Secretary of Commerce to obtain copyrights for any standard reference data. In addition, the prohibition may not apply to works created by Postal Service employees. According to the Copyright Office's General Counsel, the United States is the only developed country that has an extensive prohibition on copyrighting national government works.

Federal policy is to publicly disseminate unclassified and nonsensitive computer software by making it generally available. Accordingly, federal agencies distribute computer software primarily through (1) Commerce's National Technical Information Service (NTIS), (2) the National Aeronautics and Space Administration's (NASA) Computer Software Management and Information Center (COSMIC), and/or (3) the Department of Energy's (DOE) National Energy Software Center (NESC). In addition, federal researchers who develop software may provide it to colleagues.

Commerce operates NTIS as a clearinghouse for the collection and dissemination of scientific, technical, and engineering information, including computer software. The Secretary of Commerce is authorized to establish a schedule of reasonable fees for services performed, documents, and other publications. NTIS' operations are to be self-sustaining to the fullest extent feasible.

The University of Georgia operates COSMIC under contract with NASA to make available to potential users NASA-developed computer programs and related documentation. COSMIC is operated to be self-supporting, but NASA has subsidized its activities.

Argonne National Laboratory operates NESC under contract with DOE's Office of Scientific and Technical Information to promote the sharing of unclassified scientific and technical computer software among DOE and

[5]House Report 1476, 94th Cong., 2nd Sess. 59 (1976).

DOE contractors and disseminate DOE-sponsored scientific and technical software to private industry, the public, and foreign requesters. DOE's policy is for NESC to recover full cost for materials and services sold to persons and organizations outside the federal government. Under an inter-agency agreement, NESC software is advertised through NTIS.

Although computer programs can be patented under certain circumstances, federal agencies generally have not patented computer software. The federal patent attorneys we interviewed stated that they rarely file patent applications for software because (1) software has a short commercial life and patenting takes too long; (2) prosecuting a patent application is expensive; and (3) they are uncertain in some cases whether PTO will consider the computer program to be part of a patentable invention.

Prior GAO and Commerce Reports

We reported in March 1988 that federal officials identified the copyright law's prohibition on copyrighting federal works as one of four constraints to the transfer of federal technology to U.S. businesses and other organizations.[6] While recent changes in the law allow federal laboratories to patent and exclusively license inventions, unclassified and nonsensitive federal software generally is publicly disseminated; thus businesses may not have an incentive to fully develop and market it.

Similarly, Commerce stated in a May 1988 report to the President and the Congress that the current legal provisions denying the government copyright protection for works created by its employees constitutes a substantial barrier to successful technology transfer.[7] The report stated that firms will be unwilling to commercialize software in the public domain without copyright protection because of the high costs associated with readying it for the market. These costs include preparing documentation and training materials, "debugging" the computer program, and establishing user support systems. The report recommended that study should be immediately given to examining the need for legislation to (1) allow the government to have and convey necessary protection to computer software and (2) reward the creating scientist with a percentage of the resulting royalties.

[6]Technology Transfer: Constraints Perceived by Federal Laboratory and Agency Officials (GAO/RCED-88-116BR, Mar. 4, 1988).

[7]Report to the President and Congress Required by the Technology Transfer Act of 1986 on Barriers to the Commercialization of Federal Computer Software and Feasibility and Cost of Compiling an Inventory of Federally Funded Training Software, U.S. Department of Commerce (May 1988).

In July 1989 the Secretary of Commerce reported that federal agencies had concluded more than 100 cooperative R&D agreements but pointed out that the Federal Technology Transfer Act does not provide a suitable basis for commercializing the valuable software that is often produced at federal laboratories.[5] The report noted that virtually none of the Department of Agriculture's cooperative R&D agreements signed or under negotiation dealt with expert systems, artificial intelligence, or other forms of knowledge engineering, even though systems approaches and software-derived technology reflected a growing portion of its research. The report reaffirmed Commerce's position that the prohibition on copyrighting government works is a constraint to transferring federal software and added that the same limitation applies to semiconductor mask works.

Objectives, Scope, and Methodology

In a July 19, 1989, letter, the Chairman, Subcommittee on Courts, Intellectual Property and the Administration of Justice, House Committee on the Judiciary, requested that we follow up on our report, Technology Transfer: Constraints Perceived by Federal Laboratory and Agency Officials, which identified copyright law as a constraint to the transfer of federal software to U.S. businesses. Specifically, the Chairman asked that we examine

- federal agencies' efforts to comply with the prohibition on copyrighting government works;
- the extent to which copyright law has constrained the transfer of federal software and any other new technologies; and
- the positive and negative impacts of amending copyright law to permit federal agencies to copyright software and any other similar works, including the impact of (1) differences between federal patent and copyright policies on technology transfer and the recognition of federal inventors and software developers and (2) providing copyright and licensing authorities on the protection of the federal government's interests.

To assess agencies' efforts to comply with the copyright law, we (1) reviewed the applicability of the prohibition on copyrighting works of the federal government by examining the legislative history for the Act for the General Revision of the Copyright Law and relevant court cases

[5]The Federal Technology Transfer Act of 1986: The First 2 Years, Report to the President and the Congress from the Secretary of Commerce (July 5, 1989).

(2) interviewed officials and reviewed sales agreements at the three primary federal software distribution centers, (3) interviewed patent attorneys at federal agencies and some government-operated laboratories and reviewed any licensing and cooperative R&D agreements involving federal computer software, and (4) interviewed federal attorneys involved in revising the Defense Federal Acquisition Regulation Supplement and the Federal Acquisition Regulation in response to recent legislation and executive actions.

To determine the extent to which the copyright prohibition has constrained the transfer of federal software and other new technologies, we (1) reviewed mid-1988 correspondence from federal agencies to congressional oversight committees on their efforts to implement the Federal Technology Transfer Act, including the agencies' perceived constraints to transferring federal software, and (2) interviewed senior administrators responsible for technology transfer and patent counsels at the Departments of Agriculture, Commerce, Energy, and Defense—including the Air Force, the Army, and the Navy; the Environmental Protection Agency (EPA); NASA; and the National Institutes of Health (NIH). These seven agencies obligated about $14.3 billion in fiscal year 1989 for R&D at federal government-operated laboratories—about 90 percent of the $15.8 billion obligated by all federal agencies.

To identify the pros and cons of amending copyright law to stimulate federal technology transfer, we interviewed senior administrators and patent counsels at the seven federal agencies and, at their suggestion, laboratory research managers, researchers, technology transfer officials, and patent counsels involved in developing and/or attempting to transfer software and other new technologies to U.S. businesses or other organizations. We interviewed officials at the following offices and laboratories at each of the seven agencies.

Federal Agencies in Our Study

Agriculture
Agricultural Research Service
Office of General Counsel

Commerce
National Institute of Standards and Technology
National Technical Information Service
Office of Federal Technology Management
Office of General Counsel

Defense
Air Force
Command Headquarters Technology Transfer Office
Office of the Judge Advocate General

Army
Army Corps of Engineers
Army Materiel Command
Construction Engineering Research Laboratory
Harry Diamond Laboratories
Office of the Judge Advocate General

Navy
Data Automation Office
Naval Research Laboratory
Naval Surface Warfare Center
Office of General Counsel, Office of the Chief of Naval Research

Office of the Secretary of Defense
Research and Advanced Technology

Energy
Defense Programs
Office of General Counsel
Office of Scientific and Technical Information

Environmental Protection Agency
Environmental Research Laboratory
Office of General Counsel
Office of Research and Development

Health and Human Services
National Institutes of Health
Division of Computer Research and Technology
National Library of Medicine
Office of the Director
Office of General Counsel
Office of Invention Development

National Aeronautics and Space Administration
Goddard Space Flight Center
Information Resources Management
Office of General Counsel
Computer Software Management and Information Center

We also obtained the views of intellectual property attorneys outside the government about the pros and cons of amending copyright law or alternative legislation to stimulate the transfer of federal computer software. Among those we interviewed were officials of the American Bar Association's section on patent, copyright, and trademark and the American Intellectual Property Law Association; executives from two businesses that have considered commercializing federal software; the Computer and Business Equipment Manufacturers Association; and the Information Industry Association.

Webster's Dictionary defines computer software as the entire set of programs, procedures, and related documentation associated with a computer system. We use this definition throughout the report to include computer programs and supporting documentation but not separable data bases. Discussion of the transfer of federal computer software in this report is intended to apply to unclassified software that can be publicly disseminated but not to either classified or sensitive software.

We discussed the information included in this report with officials from the seven federal agencies, who agreed with the report's technical accuracy. However, at the Subcommittee's request, we did not obtain official agency comments on a draft of this report. Our review was performed in accordance with generally accepted government auditing standards between July 1989 and February 1990.

Federal Agencies' Efforts to Comply With the Prohibition on Copyrighting Government Works

Federal policy has been to publicly disseminate unclassified and nonsensitive government computer software by making it generally available. We found no evidence that federal agencies have copyrighted software developed by federal workers. However, Commerce's NTIS and NASA's COSMIC have included restrictive provisions in nonexclusive licensing agreements for a small percentage of the software they distribute. In addition, some DOD laboratories have transferred software to businesses through cooperative R&D agreements. Since this software is not fully developed and documented, the laboratories have not made it generally available through NTIS. Further, it is unclear whether this software would be made available to others who might subsequently request it.

The prohibition on copyrighting government works does not, on its face, apply to works developed under federal contracts, grants, or cooperative agreements. The Department of Defense (DOD) and civilian agencies take different approaches to permitting contractors and grantees to copyright and commercialize technical data and computer software that they develop with federal funds.

Software Disseminated Through Federal Software Centers

Under its current policy, the government generally disseminates unclassified and nonsensitive federal software by making it available to any interested users through NTIS, COSMIC, or DOE's NESC. These distribution centers require that software provided by federal agencies and laboratories at a minimum must be documented and usable by an external user. Federal R&D software typically is developed for an immediate agency need or an R&D project that leads to the publication of an article in a scientific journal. In many cases, federal laboratories do not send software to a federal software distribution center for dissemination because the effort to further develop and document the software is given lower priority than publishing the research results and pursuing other R&D projects.

NTIS, COSMIC, and NESC normally sell software to customers. Their marketing efforts are relatively passive and are primarily aimed at researchers who use software that federal laboratories have developed as part of their R&D mission.[1] NTIS, COSMIC, and NESC sales may not fully indicate the extent to which federal software is disseminated because (1) customers can copy and further disseminate or market the software and (2) federal laboratory researchers provide copies of software to colleagues. For

[1]Officials noted that their agencies typically procure software for administrative functions from contractors rather than developing it internally.

example, one NIH researcher mentioned distributing 300 copies of a computer program to requesters at no cost, while a company marketed the software for $600 per copy.

Agency officials stated that most of their software is adequately disseminated to users by making it generally available through federal software distribution centers and by laboratory researchers. This software typically has specific scientific applications that are useful primarily to other researchers. Alternatively, some federal software, such as the National Library of Medicine's Grateful Med program for physicians and DOD's vocational training software used to train technicians, is developed and documented sufficiently enough to be readily used by outside organizations. The Director of the National Library of Medicine and a DOD official stated that the government's and the public's interests may be best served by making this software directly available to outside users rather than by providing a company with an exclusive license to market it.

NTIS, COSMIC, and NESC recognize that copyright protection is not available for government works. However, NTIS sells about 5 percent of its software under a nonexclusive licensing agreement in which the licensee agrees not to further distribute the software without obtaining NTIS' prior permission. In addition, COSMIC has used a lease arrangement to restrict foreign access to and limit further distribution of software that has very high utility and value.

NTIS' Software Dissemination

NTIS is the primary clearinghouse for federal agencies' software, technical publications, and data bases. NTIS advertises software through its catalogue and newsletter, which provide brief abstracts, and has begun advertising in technical journals and through mailings to targeted customers. NTIS requires that a federal laboratory or agency submit a user's manual or guide with the software, and it verifies that the software operates on specified computer systems. However, NTIS provides no additional services, such as training, and will refer users with questions about software applications to the originating laboratory for assistance.

Table 2.1 shows NTIS' sales of microcomputer diskettes and magnetic tapes between 1987 and 1989. According to NTIS' manager for software sales, the declining value of software sales reflects (1) a reduction in 1988 of the average price per microcomputer diskette from $75 to $50 and (2) a decline in the number of magnetic tapes that agencies have sent to NTIS. The software sales manager added that about 5 percent of

the software accounts for a large volume of sales, including widely disseminated National Library of Medicine diskette programs such as Grateful Med. For the remaining 95 percent of the software, NTIS typically sells about 25 to 30 copies of each microcomputer diskette and about 10 copies of each magnetic tape. Table 2.1 also indicates that about 7 percent of NTIS' software sales in 1989 were to foreign customers. NTIS sells the source code, which computer programmers need to readily improve the software, to both U.S. and foreign customers, if the sale is in compliance with the Export Control Act.

Table 2.1: NTIS Software Sales, 1987-89

Dollars in thousands

	Software sales		
	1987	**1988**	**1989**
Microcomputer diskettes	$249	$197	$167
Magnetic tapes	333	402	228
Total	**582**	**599**	**395**
U.S. sales	544	533	366
Foreign sales	38	66	29

Source: NTIS

While NTIS sells most software without restrictions, it uses a nonexclusive license agreement for about 5 percent of the software, typically magnetic tapes, that contains the following restriction:

"A. Except for purposes of inhouse use, customer will not resell, copy, or otherwise reproduce; have reproduced; or willfully allow employees, customers or other parties, to resell, copy, or otherwise reproduce any portion of the software in machine-readable form without advance written permission from NTIS."

According to the manager of software sales, NTIS includes this provision only at the request of the agency supplying the software. For example, the National Institute of Standards and Technology has requested the restriction to maintain the quality of its metrology standards software that is distributed to users. A Commerce attorney stated that NTIS' restriction is based on contract law rather than on copyright protection.

COSMIC's Software Dissemination

COSMIC's marketing coordinator told us that COSMIC sells scientific software to a specialized market of universities and other scientific institutions. While a few of the computer programs COSMIC sells are very popular, a typical program is acquired by only 10 companies over its lifetime.

NASA's management instruction for distributing computer programs states that COSMIC shall make a program (1) generally available without restriction if the program has relatively limited utility by others or was previously published or released without restrictions, (2) available on a restricted basis and normally for domestic use if the program has significant utility and value and warrants only domestic distribution for a period of time, typically 1 year, or (3) available under a lease agreement with appropriate fees and restrictions, which normally include limiting its use to domestic organizations for 2 or more years, if the program has very high utility and value.

At NASA's request, COSMIC has leased 18 of about 1,200 computer programs through an agreement that limits the licensees' use and reproduction of the program. As part of the agreement, the licensee agrees to (1) not disclose or remove the program outside of its prime installation, (2) release or disclose only machine-readable code outside the United States, (3) make additional copies of the program only after obtaining COSMIC's permission, (4) refrain from changing or removing any indication of ownership of the program, copies, or computer output, (5) remove and return, or otherwise dispose of, all program tapes, copies, and documentation upon termination of the agreement.

A NASA attorney told us that COSMIC's restrictions were based on contract law. The attorney added that NASA's policy giving preference to U.S. organizations is based on the declaration of policy and purpose in the National Aeronautics and Space Act of 1958 (42 U.S.C. 2451(c)), which states that the aeronautical and space activities of the United States shall be conducted so as to contribute materially to the preservation of the role of the United States as a leader in aeronautical and space technology and its application to the conduct of peaceful activities within and outside the atmosphere.

NESC's Software Dissemination

NESC primarily distributes software developed by DOE's contractor-operated laboratories. According to a DOE official, NESC relies on its customers' voluntary agreement that they will not further disseminate federally developed computer programs without NESC's approval. Our October 1987 report on NESC showed that from October 1985 through March 1987, the center distributed 2 or more copies of 41 scientific and

engineering computer programs to U.S. organizations and 2 or more copies of 24 scientific and engineering computer programs to foreign organizations.[2]

In May 1988 DOE issued Acquisition Letter 88-1 on software policy. This letter established new procedures for its contractor-operated laboratories to obtain a release from DOE to copyright software with commercial potential. If DOE grants this release, the contractor can copyright and exclusively license the software but must make an abstract of the software available to the public through NESC. DOE's Assistant General Counsel for Patents stated that his office has received about 10 requests for releases under the new policy. Patent attorneys for contractors that operate four DOE laboratories told us, however, that the contractors decided not to amend their operating contracts to adopt the new software policy because the disadvantages outweighed the advantages, citing these examples: (1) under the new software policy, a contractor cannot obtain a release to copyright other works, such as engineering drawings and (2) the copyright could automatically revert to DOE if requisite letters, for whatever reason, are not in DOE's files. The patent attorney for another contractor-operated laboratory that amended its contract stated that the laboratory had applied for only three waivers under DOE's software policy mainly because the policy was administratively burdensome, requiring the contractor to make too many representations and certifications.

Federal Laboratories' Efforts to Transfer Software

Despite recent emphasis on transferring technology to the private sector, federal laboratories have had limited success in encouraging U.S. businesses to enter into cooperative R&D agreements to further develop and commercialize software. Some DOD laboratories have transferred software to businesses through cooperative R&D agreements. Since this software is not fully developed and documented, the laboratories have not made it generally available through NTIS. Further, it is unclear whether this software would be made available to others who might subsequently request it.

The Army Corps of Engineers has entered into or is negotiating nine cooperative R&D agreements to further develop Corps software for commercial applications. According to Corps of Engineers officials, the Corps publicized these opportunities through Commerce Business Daily

[2]Software Distribution: Review of the Department of Energy's National Energy Software Center (GAO/IMTEC-88-2, Oct. 14, 1987).

and in other ways. A Corps of Engineers attorney stated that, while copyright protection cannot be provided for federal software serving as the basis of a cooperative R&D agreement, the collaborator could copyright a jointly developed, derivative work. The Corps of Engineers may not make software involved in a cooperative R&D agreement available to others by sending it to NTIS because the software would be insufficiently developed and documented for NTIS' standards. For example, the Construction Engineering Research Laboratory has not sent to NTIS two software programs serving as the bases for ongoing cooperative R&D agreements negotiated in 1988. A Corps of Engineers attorney also noted that the Corps may turn down any subsequent requests for the original Corps' software either as part of another cooperative R&D agreement or under the Freedom of Information Act.

A patent attorney at the Naval Surface Warfare Center told us that the center has used Federal Technology Transfer Act authorities in two instances to transfer its software. Although the transfer in each case was initially conducted through a nonexclusive licensing agreement, the Navy is converting each to a cooperative R&D agreement. According to a Navy attorney, the Navy would not use a cooperative R&D agreement as the basis for withholding the Naval Surface Warfare Center software from another business requesting access. However, the Naval Surface Warfare Center has not sent this software to NTIS because (1) it has not been sufficiently developed and documented and (2) laboratory managers do not perceive that making software generally available through NTIS is a sufficiently effective means to transfer the software to justify the added resources and time needed to meet NTIS requirements.

Officials at several other agencies have sought to attract businesses to commercialize their laboratories' software that was insufficiently developed and documented for external use. However, these officials indicated that they have had difficulty in transferring this software, particularly through cooperative R&D agreement because (1) businesses are unwilling to put the time and money into commercializing federal software without adequate intellectual property protection and the assurance of some kind of exclusivity and (2) the extent to which the copyright prohibition applies to software developed jointly by federal and nonfederal effort has to be reviewed on a case-by-case basis.

Software Developed Under a Contract, Grant, or Cooperative Agreement

Federal agencies' policies for allowing contractors and grantees to copyright and commercialize software do not appear to contravene federal copyright law. On its face, the copyright prohibition (17 U.S.C. 105) applies only to a "work of the United States government," which is defined as one prepared by an officer or employee of the U.S. government as part of that person's official duties. The copyright law is silent on whether this restriction is applicable also to works funded by federal agencies but produced by private entities. However, the legislative history for the Act for the General Revision of the Copyright Law indicates that decisions on whether to allow copyrights of works produced under contracts, grants, or cooperative agreements should be left to the discretion of the funding agency:

> A more difficult and far-reaching problem is whether the definition [of a work of the U.S. government] should be broadened to prohibit copyright in works prepared under U.S. Government contracts or grant. As the bill is written, the Government agency concerned could determine in each case whether to allow an independent contractor or grantee, to secure copyright in works prepared in whole or in part with the use of Government funds...
>
> The bill deliberately avoids making any sort of outright, unqualified prohibition against copyright in works prepared under Government contract or grant. There may well be cases where it would be in the public interest to deny copyright in the writings generated by Government research contracts and the like...However, there are almost certainly many other cases where the denial of copyright protection would be unfair or would hamper the production and publication of important works...[3]

Judicial opinion also has confirmed that works made on commission for the U.S. government may be copyrighted by the contracting party (Schnapper v. Foley, 667 F2d 102 (D.C. Cir. 1981) cert. den'd. 455 U.S. 948 (1982)).

DOD and the civilian federal agencies have developed separate approaches in their acquisition regulations regarding the rights of contractors and grantees to copyright and exclusively commercialize technical data and computer software that they developed under a federal contract, grant, or cooperative agreement.

DOD's Interim Regulation

On October 28, 1988, DOD issued an interim rule revising its policies and procedures relating to the acquisition of, rights in, and copyrights of

[3]Senate Report 473, 94th Cong., 2nd Sess. 56-57 (1976) and House Report 1476, 94th Cong., 2nd Sess. 59 (1976).

technical data, other data, and computer software under a DOD contract.[4] DOD's policy, to be codified under part 227.480(c), is to allow a contractor to copyright any work of authorship developed under a contract, unless the work is designated a "special work."[5] In return, the contractor is required to grant to the government and authorize the government to grant to others a nonexclusive, paid-up, worldwide license for government purposes in any work of authorship first prepared, produced, originated, developed, or generated under the contract.

The scope of the government's license corresponds to the rights the government has obtained under the contract. For software, the government typically will acquire "unlimited" rights if software is developed exclusively at government expense or "restricted" rights if the software is developed exclusively at the contractor's expense. For technical data, the government typically will acquire (1) "unlimited" rights if the technical data are developed exclusively at government expense, (2) "limited" rights if the technical data are developed exclusively at the contractor's expense, or (3) "government purpose license" rights if the technical data are developed with joint funding.

According to DOD procurement attorneys, the government's unlimited rights to software or technical data, in effect, could make them generally available to others. If the government has limited or restricted rights, it cannot release or disclose such data outside the government or use the data for manufacture without the contractor's written permission. Government purpose license rights are a combination of limited and unlimited rights.

DOD procurement attorneys told us that DOD historically obtained unlimited rights to jointly funded technical data and software. However, various amendments to the rights in technical data provision in 10 U.S.C. 2320 have changed DOD's right to jointly funded technical data. In particular, section 953 of the Defense Acquisition Improvement Act of 1986 (P.L. 99-661) required that DOD's rights to jointly funded technical data be negotiated. Section 808 of the National Defense Authorization Act for Fiscal Years 1988 and 1989 (P.L. 100-180) further clarified a DOD contractor's rights to these data. Because the technical data provision does not cover software, DOD's rights to jointly developed software generally

[4]53 Fed. Reg. 43698 (Oct. 28, 1988), which is to be codified at 48 C.F.R. Parts 227 and 252.

[5]The contractor may not assert any rights or claim to copyright in special works, such as departmental histories or works pertaining to recruiting, morale, training, or career guidance. Special works are used in all contracts where the government needs ownership and control of the work to be generated.

have not been affected. Reflecting these amendments, DOD's interim regulation provides for a government purpose license right, which limits the government's right to use, duplicate, or disclose data (and computer software in the Small Business Innovation Research program) or permit others to do so for government purposes only, including competitive procurement.[1] The interim regulation further states that the government purpose license rights, which generally are to be negotiated in advance, should be time limited—normally for 1 to 5 years after the estimated date for the contractor's delivery of the product to which the data pertain. However, a longer period may be negotiated to provide the contractor a reasonable opportunity to recover its investment. The government retains unlimited rights to the data after the time period expires.

Federal Acquisition Regulation

Under the Federal Acquisition Regulation (48 C.F.R. Part 27.404(f)) for federal civilian agencies, a contractor or grantee generally is required to obtain the permission of the contracting officer to establish a copyright claim subsisting in data, including technical data and software, first developed in the performance of a contract. However, prior approval usually is not required for claims to copyrights in technical or scientific articles based on or containing data first produced in the performance of a work under a contract and published in academic, technical or professional journals, symposia proceedings, and similar works. Blanket permission to establish copyright claims is required to be used under certain circumstances in contracts for basic or applied research to be performed solely by colleges and universities.

When a contractor establishes claim to a copyright in data (other than software) first produced in the performance of a contract, the government is granted a paid-up, non-exclusive, irrevocable, worldwide license to reproduce, prepare derivative works, distribute to the public, perform publicly and display publicly by or on behalf of the government any such data. For software, the scope of the government's license does not include the right to distribute it to the public.

[1] The government purpose license right was introduced in 1987 (48 C.F.R. Part 227.471).

Copyright Law Constraints on the Transfer of Certain Federal Technology

According to officials we interviewed at seven federal agencies, most of their agencies' computer software is adequately transferred to users through federal software distribution centers and by laboratory researchers. However, senior officials at six of the agencies stated that the copyright law's prohibition on copyrighting federal works has constrained their efforts to transfer software with broader commercial applications to a significant but not precisely determinable extent.[1] These officials told us that their agencies would like to stimulate the transfer and use of this software through copyright and licensing authorities, which are important for attracting businesses to invest in developing and marketing it. DOE officials said that the copyright prohibition has not constrained their efforts to transfer computer software because almost all of their research-related software is developed by contractor-operated laboratories, which can obtain a release from DOE on a case-by-case basis to copyright commercially useful software.

NASA and some DOD officials believe that authority to protect and license semiconductor mask works would be useful for their efforts to transfer this technology in the future. However, only a few federal laboratories conduct R&D involving semiconductor mask works, and the officials did not identify any examples in which the transfer of mask works had been constrained. In addition, National Institutes of Health (NIH) officials suggested considering new intellectual property protection that would be faster and less expensive to obtain than currently available patent protection for cells and other microorganisms developed through biomedical research.

Some agency officials we interviewed proposed amending copyright law to permit the government to copyright data bases as a way to partially recoup costs for maintaining, enhancing, and distributing the data bases. The officials suggested that the funds be used to supplement available funds for maintaining and enhancing the data bases and disseminating data base information. Several agency officials suggested repealing the federal copyright prohibition, stating that public access to and further dissemination of government information could be protected by alternative means.

[1] These agencies obligated about $14 billion for R&D at government-operated laboratories in fiscal year 1989—about 89 percent of all such R&D obligations.

Constraints to Transferring Federal Computer Software

Senior administrators, patent attorneys, and technology transfer officials we interviewed at Agriculture; Commerce; DOD, including Air Force, Army, and Navy; EPA; NASA; and NIH stated that the prohibition on copyrighting federal works has significantly constrained their efforts to transfer certain software to U.S. businesses and other organizations. These officials told us that federal software could be more effectively transferred and more widely used if agencies had authorities similar to those for commercializing federal inventions to (1) copyright software and grant a partially exclusive or exclusive license for it and (2) provide an incentive to federal researchers to further develop and document the software by allowing them to share in any royalties received from licensing it.

DOE officials told us that the prohibition on copyrighting government works has not constrained their efforts to transfer software because DOE employees develop very little software. Contractor-operated laboratories have generated almost all of DOE's research-related software. Under DOE's software policy, a contractor can obtain a release from DOE to copyright and commercialize software.

Businesses Want to Protect Investments in Commercializing Technologies

Agency officials believe a substantial portion of their laboratories' software has broader commercial applications and this software could be transferred most effectively if the government had the authority to copyright it and grant partially exclusive or exclusive licenses. Agriculture, EPA, NASA, and NIH officials stated that a conservative estimate of software with potential commercial applications would be 10 percent of all of the software developed. Agency officials distinguished software from traditional copyrightable works such as publications or data bases, stating that software is technology that can be modified for other commercial applications. For example, a growing number of federal R&D programs provide artificial intelligence for improving decisions made by, among others, doctors diagnosing diseases and prescribing drugs, farmers growing cotton in the southern United States, or architects designing buildings for fire safety. In addition, in some cases the laboratories have developed graphics and other applications programs with commercial potential.

The agency officials told us that software would be commercialized most effectively by providing copyright protection and then either (1) licensing it to a U.S. business that specializes in developing and marketing software or (2) signing a cooperative R&D agreement with a business to

further develop and commercialize it. According to the Director of Classification and Technology Policy for DOE's Defense Programs, DOE's contractor-operated laboratories can better commercialize software that they develop than DOE's National Energy Software Center can because they (1) will more aggressively transfer the software, which needs to be commercialized quickly because of its short lifespan, and (2) can better determine the value of getting, for example, free upgrades of the programs as opposed to higher royalties in negotiating a licensing agreement.

The agency officials added that, like patent protection for inventions, copyright protection is important for attracting a business to commercialize federal software for the following reasons:

- The federal computer program may have been developed only for the laboratory's R&D need and may not be immediately usable for commercial applications. A business would have to invest money to (1) enhance the program for commercial applications, (2) debug and simplify the program, (3) develop manuals and other documentation, and (4) provide support services for users, such as training and a hotline to respond to questions.
- Before commercializing federal technology, a business would want to protect its investment. In the case of an invention, the business may negotiate an exclusive or partially exclusive license to the patent that would exclude others from practicing or using the invention. Under current copyright law, however, a business that commercializes federal software can copyright only the derivative work that it contributes. The business does not have the exclusive right to use or market parts of the computer program that federal employees developed.
- Other organizations, including potential competitors and customers, can gain access to completed federal software through NTIS or another federal software distribution center. Alternatively, the agency that developed the software may provide it through a request under the Freedom of Information Act. Without copyright protection, competitors and customers could market or use the federal software, reducing the potential market for the software and a company's return on investment.

Similarly, a Control Data Corporation executive told us that copyright protection and exclusivity are essential for protecting his company's investment in developing software for commercial applications. Control Data would seek to commercialize a computer program only with adequate protection, unless market demand for it was known to be large. The Control Data executive pointed out that another company could

obtain publicly available software, make minimal changes and/or provide documentation, and start competing. Control Data would then be competing against a company that has a product of lower quality that could be sold at a lower price. At a minimum, this would create confusion in the market until customers could differentiate between the value provided by each product, eroding Control Data's ability to sell the software and get its return on investment, which is absolutely timese[illegible]e.

Examples of Constraints to Transferring Federal Software

Federal agency and laboratory officials stated that they cannot precisely determine the extent to which the transfer of their laboratories' software has been constrained. Many federal researchers and outside businesses know the government cannot copyright software and therefore they do not seek to commercialize the software either by licensing it or through a cooperative R&D agreement. In other cases, senior laboratory administrators, technology transfer officials, and patent attorneys never learn of opportunities to transfer laboratory software because preliminary negotiations, which occur at lower levels within the laboratory, fall apart early on since copyright protection for the federal software is unavailable.

Laboratory and agency officials identified several specific instances in which the transfer of their laboratories' software was constrained because a business could not protect it by a copyright. The following are two examples of such cases:

- The lack of copyright protection has constrained efforts to commercialize a computer program, jointly developed by an NIH researcher and a practicing dermatologist, according to an NIH laboratory manager. This program would assist dermatologists in prescribing medications and other treatments for medical problems, such as acne, and providing advice and information to patients. The NIH official told us that because the software needed to be tested among larger groups of dermatologists before it could be marketed, NIH sought a business that would assume this responsibility. An executive for Clinical Reference System, Inc., a small business located in Colorado, stated that his company was interested in the software, but it was clearly an early version that would have had to be further developed before it could be marketed. His company decided not to try to commercialize the software because it believed dermatologists were not ready to accept and use the software. Another important factor in the company's decision was its inability to obtain copyright protection, which created uncertainty over whether it

could sufficiently protect its investment from a competitor who might be able to obtain the software from NIH or NTIS. NIH has not further developed the software and has yet to attract a business partner to commercialize it. NIH also has not sent the software to NTIS for public dissemination because it is not sufficiently developed and documented.

- Establishing a mechanism for marketing the Gossym-COMAX computer program has taken several years of concerted effort, which could have been saved if federal agencies had the authority to copyright and exclusively license software, according to the Agricultural Research Service's Assistant Administrator for Cooperative Interactions. Researchers at the Agricultural Research Service, Mississippi State University, and Clemson University jointly developed Gossym-COMAX over a period of more than 10 years to maximize cotton yields in the southern United States by assisting farmers in deciding, for example, when to irrigate, fertilize, and defoliate their cotton crops. Because of their uncertainty about whether the jointly developed software could be copyrighted and licensed, Agriculture, Mississippi State, and Clemson mutually agreed to initially distribute Gossym-COMAX in Mississippi through Mississippi State University's cooperative extension service. However, their efforts to expand distribution beyond Mississippi met resistance in some states that had not participated in developing the software and associated the program with Mississippi.

  Subsequently, in February 1989, Mississippi State and Clemson jointly copyrighted the Gossym-COMAX program. Agriculture officials supported copyright registration because they believed the contributions of researchers from the Agricultural Research Service, Mississippi State, and Clemson were sufficiently intermingled; no discernable federal portion existed. Agriculture, Mississippi State, and Clemson also have tentatively agreed to use the National Cotton Council of America, a nonprofit organization representing all segments of the cotton industry, to help Gossym-COMAX gain wider acceptance among state extension services and cotton growers. In addition, a software house has expressed interest in marketing Gossym-COMAX provided it could obtain copyright protection and an exclusive license. No final decision has been made on how to market and service Gossym-COMAX. Two Agriculture officials told us that another year could pass before such a decision is made because a large number of organizations, including federal and state extension services, are now involved in the dissemination effort. Agriculture officials noted that the Agricultural Research Service is developing similar computer programs in other areas, such as soy beans, semi-arid lands, and food processing.

Agency officials also told us that businesses generally have been unwilling to enter into cooperative R&D agreements to further develop federal laboratories' software because the businesses could not protect the federal laboratory's portion of the software. According to the NIH's Director, Office of Invention Development, while NIH has signed about 130 cooperative R&D agreements, it is negotiating its first agreement with a major software component. Similarly, the Agricultural Research Service's Assistant Administrator for Cooperative Interactions stated that software is not the focus of any of about 140 cooperative R&D agreements that the Agricultural Research Service has signed or is negotiating. An EPA official also stated that none of EPA's nine cooperative R&D agreements focus on software.

In contrast, Army Corps of Engineers attorneys told us that 9 of the 26 cooperative R&D agreements that the Corps of Engineers has entered into or is negotiating are to further develop software. Nevertheless, Corps attorneys stated that the inability to copyright federal software has constrained cooperative R&D agreement negotiations. Businesses and other organizations are seeking to negotiate cooperative R&D agreements with the Corps of Engineers, in part because the Water Resources Development Act of 1988 (P.L. 100-676) authorized the Corps to fund up to 50 percent of costs for approved cooperative R&D agreements under a new Construction Productivity Advancement Research program. According to a Corps of Engineers attorney, joint R&D funding is an important element for three software agreements with nonprofit organizations, which plan to make the final software products generally available. In addition, as discussed in chapter 2, it is unclear whether Corps would make software that is the basis for a cooperative R&D agreement available to others who might subsequently request it.

Providing Researchers an Incentive to Further Develop Computer Software

Agency officials stated that, as in the case of federal inventions, the transfer and use of computer software would be stimulated further by allowing federal researchers to share in any royalties generated by licensing the software. The researchers who developed the software would best know how it functions and how to modify it for commercial applications. Royalty sharing would provide researchers with an incentive to collaborate with a licensee or a cooperative R&D agreement partner to debug, simplify, enhance, and document the computer program.

Potential Additional Revenue to Fund NTIS' Dissemination Activities

NTIS officials support extending copyright authority to all federal software because NTIS, which receives no appropriations, relies on sales revenues to operate its distribution and archive programs. According to the officials, copyright protection would enable NTIS to increase its software customer base and sales, in part by preventing companies from reselling federal software. The officials added that NTIS probably would not increase its software prices unless it was required to pay royalties back to agencies that developed the software. COSMIC's marketing coordinator stated that copyright authority would not affect COSMIC's activities because COSMIC primarily sells software to a small scientific market.

Constraints to Transferring Other Federal Technology

Some federal agency and laboratory officials identified two technologies in addition to software that they believe are constrained by intellectual property laws.

Semiconductor Mask Works

While many federal agencies develop software as part of their R&D programs, only a few government-operated laboratories conduct R&D on semiconductor manufacturing technology. Army, Navy, and NASA officials support amending the prohibition on protecting federal mask works (17 U.S.C. 903) to allow federal agencies to protect semiconductor mask works. Although they did not identify examples in which the prohibition on protecting government mask works had constrained the transfer of this technology to U.S. businesses, these officials believe that mask works protection would improve their future technology transfer efforts. However, some business representatives stated that advances in semiconductor manufacturing technology has reduced the utility of protecting mask works under the Semiconductor Chip Protection Act.

New Protection for Cells and Other Microorganisms

Cells and other microorganisms developed in a laboratory can be patented.[2] These include cell lines and hybridoma, which are used to produce unlimited quantities of monoclonal antibodies at a low cost. These monoclonal antibodies may be useful in immunology research for preventing cancer and other diseases. However, because patenting and commercializing a cell line or a hybridoma is a high-cost, high-risk proposition, NIH officials suggested that consideration be given to establishing additional intellectual property protection for cells and

[2]In Diamond v. Chakrabarty (447 U.S. 303 (1980)), the Supreme Court held that living, man-made microorganisms were patentable subject matter.

microorganisms that is less costly and faster than obtaining patent protection. According to NIH officials, the commercial utility of a cell or microorganism is uncertain because many, if not most, of the thousands of cells or microorganisms that can be created will have no commercial utility. The NIH officials perceive patenting as too costly and taking too long to protect this biotechnology unless an immediate commercial application is known or expected.

Sui generis, or unique, protection for cells and other microorganisms could be established by amending the patent statute (Title 35) to add a new chapter that provides patent-like protection. This patent-like protection could be administered by the Patent and Trademark Office or, alternatively, an agency that conducts biomedical R&D. For example, Agriculture administers sui generis protection for sexually reproducing plants under the Plant Variety Protection Act (7 U.S.C. 2321 et seq.). (App. I presents alternative legislative issues and approaches that NIH officials identified for sui generis protection for cells and other microorganisms.)

Computer Data Bases

Some officials at DOD, the Agricultural Research Service, and NTIS suggested that consideration be given to amending copyright law to permit federal agencies to copyright and license data bases, principally to recover costs associated with maintaining and better disseminating the data base's information. A DOD official stated that in some cases DOD may decide not to maintain or publicize a data base because it has insufficient funds available to cover the associated costs. Similarly, two Agricultural Research Service officials mentioned that tight R&D budgets and competing priorities constrain their agency's ability to further develop a data base and provide better services for responding to individual requests for special analyses. NTIS officials stated that copyright authority would enable NTIS to increase its customer base and revenues by preventing companies from reselling federal computer data bases without approval.

Officials of the Information Industry Association, which represents businesses that create and distribute information, believe that federal data bases should continue to be available to the public. They oppose allowing federal agencies to copyright data bases because the agencies could (1) restrict access or give favored access to a data base and (2) compete with businesses in providing specialized services to customers. As discussed in chapter 4, the officials also believe that software should

continue to be available to the public, noting that a fine line exists between software and computerized data bases.

Copyright Authority for All Government Works

Several agency officials we interviewed proposed repealing the copyright prohibition for all federal government works. In addition to improving technology transfer for federal software, the officials cited the following reasons for their views:

- Copyright authority would allow the federal agency to prevent third parties from misrepresenting the authorship of a federal government work.
- Computer technology allows (1) the ready expression of ideas in different media, such as computer diskettes or publications, and (2) storage on diskettes of both a data base and the computer program to retrieve and cross-index it. If the government were allowed to copyright only computer software, a federal laboratory could decide to disseminate technology as a computer program instead of as a publication solely because it could be copyrighted. In addition, federal agencies would have to determine on a case-by-case basis whether works containing both computer programs and data bases could be copyrighted.
- Publishers have turned down contributions written by DOD professors at the military academies and other universities. The publishers expressed concern about copyright protection for a book that includes works that cannot be copyrighted.
- The United States is the only major developed country that has an extensive prohibition on copyrighting national government works.
- NTIS does not receive appropriations and, consequently, is funded solely by its sales revenue. Copyright authority would enable NTIS to increase revenue by preventing companies from reselling federal software, data bases, and publications.

According to some agency officials, alternative mechanisms could be used to protect the public's access to and use of these works. For example, government works that need no protection could display a label indicating that they are dedicated to the public and are therefore exempt from copyright enforcement.

The Pros and Cons of Amending Copyright Law to Stimulate the Transfer and Use of Federal Computer Software

According to senior officials we interviewed at six federal agencies, the copyright law should be amended to permit the government to copyright and grant partially exclusive and exclusive licenses for computer software. The officials also support amending the Federal Technology Transfer Act to enable federal researchers to share in any royalties generated by licensing the software. They believe these changes would (1) improve the transfer and use of federal software with commercial applications because U.S. businesses and other organizations could protect their investment, (2) provide federal researchers who develop software similar opportunities as those available to federal inventors for career, financial, and intellectual recognition, (3) facilitate public access to federal software in certain instances, and (4) further agencies' mission to improve public health and safety. (App. II identifies alternative legislative issues and approaches that patent attorneys at the seven federal agencies identified for stimulating the transfer and use of federal software and semiconductor mask works.)

Some federal laboratory managers and researchers, however, oppose amending copyright law. They are concerned that copyrighting and licensing federal software would (1) distract researchers from the laboratory's basic research mission, (2) interfere with informal exchanges of information and software among federal and university scientists, and (3) interfere with the existing government policy of publicly disseminating technical information. In addition, Information Industry Association officials oppose allowing federal agencies to copyright software because agencies might either restrict access or give favored access to federal scientific and demographic data bases provided by software.

Transfer and Use of Software With Commercial Applications

Senior officials at Agriculture; Commerce; DOD; including Air Force, Army, and Navy; EPA; NASA; and NIH support amending copyright law to allow the government to copyright and license computer software and federal researchers to share in any resulting royalties. According to the officials, software is a technology that in many instances needs to be further developed before it can be marketed. They added that these authorities, which are needed to protect such development, are a logical extension of legislative changes enacted in the past 10 years for inventions. The agency officials perceived copyright and licensing authorities as tools to improve their agencies' technology transfer efforts because (1) with copyright protection for their value added, businesses would be more willing to further develop and market federal software and (2) the opportunity to share at least 15 percent of any royalties would give federal researchers greater incentive to work with businesses to develop

commercial software products. As a result, the officials believe this software would be more widely used for commercial applications than under current government policy.

Private intellectual property attorneys and business executives confirmed the importance of providing a business intellectual property protection for its investment in commercializing a technology. One attorney stated that companies are concerned about speed and certainty in licensing technology, adding that if an agreement cannot be closed within 6 months or if ownership rights are clouded, the business is likely to find alternative projects for its funds. A Control Data Corporation executive strongly agreed with this statement, adding that exclusive intellectual property rights to federal software are an essential prerequisite for his company to invest in commercializing it, unless the software is known to have a large market.

In addition, NASA and Agricultural Research Service officials support copyrighting and licensing commercially useful federal software to give preference to U.S. businesses and farmers. The Agriculture officials noted that software distributed through NTIS is equally available to U.S. and foreign customers, even though only U.S. taxpayers paid for the R&D. They added that, alternatively, licensing the software could contractually limit its distribution to U.S. organizations.

One senior EPA laboratory manager and officials of the Information Industry Association expressed concern that allowing federal agencies to copyright and exclusively license computer software might restrict access and/or increase the cost to the public for access to this software. They stated that federal agencies would be less likely to publicly disseminate the software by sending it to NTIS or another software distribution center.[1] The Information Industry Association officials also noted that a fine line exists between software and computerized data bases. They stated that because more and more government information of all kinds is maintained only in electronic formats, the association is concerned that even the possibility that federal agencies could claim copyright in such data bases would constrict public access to government information and chill development of private sector information products based on such information. In addition, the EPA laboratory manager stated that

[1]It is also unclear whether members of the public could get access to this software through a Freedom of Information Act request because some agencies deny requests for software, deeming it a tool rather than a record.

providing exclusivity would make U.S. users pay twice for the software since taxpayers paid for the development of the original software.

Impact on Federal Researchers

Almost all of the federal laboratory and agency officials and many of the researchers we interviewed support amending copyright law for federal software to provide increased recognition for federal researchers who develop software for the following reasons:

- Current law treats federal researchers unequally. As in the case of a federal researcher who makes an invention, a federal researcher who develops software should be eligible to share in any royalties from licensing the copyrighted software.
- In making career advancement decisions, federal laboratory administrators give great weight to the publications and patents of researchers. However, they do not give similar weight to researchers' efforts to develop and document software with commercial applications.
- Companies can market federal software in the public domain under their own name without authorization from the originating laboratory and without recognizing the federal researchers who developed the software. Alternatively, in some instances companies have advertised that a federal laboratory developed the software to add to the company's credibility, but because the company modified the software, the federal researchers and laboratory did not wish to be associated with this new product.

In addition to providing greater recognition for federal researchers who develop software, copyright and licensing authority may reduce the time a researcher is obliged to take away from research to respond to users' questions, according to some officials. The Director of the National Library of Medicine cited an NIH researcher who described an algorithmic software program he developed in a national medical journal. The researcher subsequently received a large number of requests for help and training in applying the program, which could have been transferred to a company that would service the software under a copyright licensing agreement. According to agency patent attorneys, copyright and licensing authorities for software would add only marginally to their office's administrative responsibilities. They noted that registering for copyright protection does not require the specialized legal skills needed to prosecute a patent application.

Some of the federal researchers and laboratory managers we interviewed expressed concern about providing researchers with greater

incentives for transferring software because further developing the software would detract from the laboratory's R&D mission and open exchanges among researchers:

- One research manager stated that 90 percent of the effort in developing commercial software goes into the last 10 percent of the development and documentation effort. The manager believed that federal researchers should focus on generating and publishing ideas and leave to industry the responsibility for developing commercial software applications.
- Similarly, some researchers told us that emphasis on copyrighting and licensing software would shift priorities from basic research to applied research with commercial applications, which they considered to have less long-term importance for advancing the field of research.
- A research manager and a researcher were concerned that commercializing federal software would inhibit the free flow of ideas within a laboratory or among researchers at different institutions because researchers would withhold information that might be commercially valuable. The researcher mentioned that this also could affect the availability of software for researchers through computer bulletin boards.
- A research manager pointed out that assigning royalties for software is likely to be more complex than for inventions because many more people are likely to be involved in the stages of its development.

Facilitating Public Access

Agency officials support allowing the government to copyright and license federal software with commercial applications to stimulate its dissemination to and use by U.S. businesses and other organizations. In many cases federal laboratories do not send research-related software to federal software distribution centers for general dissemination. For example, officials at two DOD laboratories told us that their laboratories generally do not send software to NTIS. According to one of the officials, his laboratory has little incentive to develop and document it sufficiently to meet NTIS' minimum requirements. Similarly, Agricultural Research Service and NIH officials stated that they normally rely on their researchers to provide software to colleagues and others upon request. As shown in table 2.1 in chapter 2, NTIS' software sales declined from $582,000 in 1987 to $395,000 in 1989. An important reason for the decline is that agencies are sending fewer large computer programs to NTIS, which typically sells only about 10 copies of these programs.

Copyright and licensing authorities also are likely to increase the dissemination and use of federal software because a licensee typically

would provide enhanced versions of the software and user support services, such as training and hotlines. For example, NASA's NASTRAN software is available through COSMIC and a former NASA contractor that developed it. Users prefer the contractor's version of NASTRAN even though it is substantially more expensive and even though COSMIC provides user support services for its version.[2] The reason for this preference, according to COSMIC's marketing coordinator, is that the contractor's version is easier to use, has more enhanced modules for specific commercial applications, and is better advertised. An Army Corps of Engineers researcher involved in two software cooperative R&D agreements also pointed out that the Corps and its contractors benefit from the transfer of software because they can get access to the enhanced versions of the software and support services that the cooperative R&D agreement partner subsequently provides.

In addition, NIH's patent attorney stated that copyright protection could protect the public's access to federal software, citing an example of National Cancer Institute software for diagnosing cancer that NIH put in the public domain and distributed to medical schools. An outside company modified the software, copyrighted the derivative work, and threatened to sue the medical schools for copyright infringement unless they licensed the company's software. The patent attorney stated that (1) because the software was in the public domain and had no registration date from the Copyright Office, the schools could not readily demonstrate that they were using the NIH version and (2) NIH has insufficient resources to act against companies that try to exploit its software.

Furthering Agencies' Health and Safety Mission

Officials of the Agricultural Research Service, the Air Force, the Army Corps of Engineers, the National Library of Medicine, the National Institute of Standards and Technology, and the Naval Research Laboratory stated that copyright protection would enable federal agencies to further their mission of promoting public health and safety by controlling the distribution of health and safety-related software. For example, these officials noted that their laboratories' artificial intelligence software is targeted for skilled practitioners, such as doctors, to diagnose diseases; architects, to design fire safety in buildings; and land use planners, to control erosion. However, because federal software is put in the public domain under current policy, the federal laboratories have no control over a company that obtains the software regarding (1) to whom

[2]NASTRAN is one of about six computer programs for which COSMIC or NASA provides user support services.

it sells the software, (2) any modifications it makes to the software, (3) whether customers are trained to use the software properly, and (4) whether customers are notified of the federal agency's updates to the software, including corrections of any mistakes in it. Army Corps of Engineers attorneys mentioned, for example, that companies have advertised in construction industry magazines the availability for sale of Hydrological Engineering Center software, known as HEC I and II, without the Corps' authorization.[3]

The Director of the National Institute of Standards and Technology cited as an example Hazard I, an artificial intelligence program for planning fire prevention in a building by analyzing how a fire would spread.[4] The National Institute has licensed Hazard I to the National Fire Protection Association but also has made the software available through NTIS. The director expressed concern about the government's liability if (1) Hazard I was marketed by a company that obtained it through NTIS, (2) Hazard I was then incorrectly applied by a customer who had insufficient knowledge of the software and the building being analyzed, and (3) a subsequent fire caused greater property damage and/or personal injuries because Hazard I had been misused.

Although copyright protection is not available, federal agencies can use trademark protection to prevent unauthorized companies that market their software from using its formal name. NASA has registered trademarks for COSMIC and some of its software. According to the NIH patent attorney, the National Library of Medicine and the National Cancer Institute similarly have used trademark protection. In addition, the Agricultural Research Service and its partners are considering registering the Gossym-COMAX name.

Protecting the Government's Interests

Patent attorneys for Agriculture, DOD, NASA, and NIH told us that federal agencies would need authorities similar to those for licensing patents (35 U.S.C. 209) to protect the government's and the public's interest. These authorities (1) require agencies to grant an exclusive or partially exclusive license only if, after providing public notice and the opportunity for filing written objections, it determines that such a license best serves the

[3]HEC I models runoff from rainfall and snowmelt and HEC II models the impact of rainfall and snowmelt on a river's floodplain.

[4]The software analyzes information about a building's structure, number of occupants, and location of the fire to calculate how the fire and gases will move, the extent of damage to the building, and the number of people who could be killed or injured.

interests of the federal government and the public, (2) require potential licensees to submit a plan for developing and/or marketing the software and periodic utilization reports, and (3) provide for the agency's right to terminate the license in whole or in part if the licensee does not diligently execute the submitted plan.

According to several federal patent licensing officials, the decision whether to issue a nonexclusive, partially exclusive, or exclusive license should be made on a case-by-case basis after considering factors such as the potential licensee's investment in developing and servicing the software and the size of the potential market. The patent licensing officials also believe that the government's rights to derivative works as opposed to a percentage of royalties would best be negotiated case-by-case.

Conclusion

According to senior officials at six federal agencies, copyrighting, licensing, and royalty sharing authorities will stimulate the transfer and use of federal software with commercial applications by providing businesses protection for the investment of their resources and by providing federal researchers with an incentive to further develop and document the software. The officials stated that, as in the case of commercializing inventions, businesses are unwilling to invest in developing and marketing federal software without copyright protection. Executives from two businesses that have considered commercializing federal software, noting that return on investment is time-sensitive, said that their companies would require copyright protection and exclusive rights to federal software before further developing commercial applications to prevent competitors from getting access to the federal software. In some cases, copyright authority also would facilitate public access to federal software and further the missions of agencies to improve public health and safety.

The senior agency officials noted, however, that most of their agencies' software has specific scientific applications and is adequately transferred through federal software distribution centers and by laboratory researchers. Some federal laboratory managers and researchers opposed amending copyright law, expressing concern that copyrighting and licensing federal software would distract researchers from the laboratory's basic research mission or interfere with informal exchanges of information and software among federal and university scientists. In addition, Information Industry Association officials opposed allowing

federal agencies to copyright software because agencies might either restrict access or give favored access to federal data bases.

Matters for Consideration by the Congress

To effectively transfer and use federal computer software while accommodating concerns about access to federal data bases and shifting federal laboratories' basic research mission, it may be appropriate to provide copyright and licensing authorities for federal software with wider commercial applications that needs further investment to be effectively transferred. This change could be accomplished by amending (1) the copyright law (17 U.S.C. 105) to allow federal agencies to copyright and grant nonexclusive, partially exclusive, or exclusive licenses to computer software on a case-by-case basis if such protection would stimulate its effective transfer and use or (2) the Federal Technology Transfer Act (15 U.S.C. 3710a) to authorize agencies to copyright and grant licenses to federal software under a cooperative R&D agreement.

Under either option, consideration should be given to extending the Federal Technology Transfer Act's royalty-sharing authority (15 U.S.C. 3710c) to include federal software. In addition, if the copyright law is amended, it would be appropriate to include procedures similar to those required for granting patent licenses (35 U.S.C. 209) to ensure fairness in granting an exclusive or partially exclusive license for federal software to a nonfederal entity and diligence by the licensee in commercializing the software.

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Alternative Legislative Issues and Approaches for Establishing Sui Generis Protection for Cells and Other Microorganisms as an Alternative to Patent Protection[1]

In establishing sui generis protection for cells, including cell lines and hybridomas, and other microorganisms, the following approaches and issues may be considered:

What agency should administer the program?

- 1. The Patent and Trademark Office. An NIH attorney we interviewed supported amending the patent statute (Title 35) by adding a new chapter that would give PTO administrative responsibility.
- 2. Health and Human Services or another agency that conducts biomedical research. The Plant Variety Protection Act gave Agriculture responsibility for administering sui generis protection for sexually reproducing plants by amending Agriculture's statute (7 U.S.C. 2321 et seq.).

What should be required for protection?

- 1. Registration similar to copyrights and semiconductor mask works.
- 2. Examination of the application for novelty. This would be similar to the approach of the Plant Variety Protection Act, which requires an examination for novelty but does not require that a new plant be nonobvious.

What should be the period of protection?

- 1. Patent protection is for 17 years, and plant variety protection is for 18 years. The NIH attorney believed that 17 years would be appropriate, given the time needed for Food and Drug Administration's regulatory review.
- 2. A shorter term. The term for semiconductor mask work protection is 10 years.
- 3. A longer term. The term for copyright protection typically is the life of the author plus 50 years.

Should recipients of sui generis protection be required to maintain a sample of the cell or microorganism and/or deposit a sample in a central depository?

- 1. The recipient of protection should be required to either (a) make sufficient disclosure about the creation of a cell or microorganism or (b)

[1]NIH officials identified alternative approaches for sui generis protection.

deposit the cell or microorganism at a central depository to provide public access to it. This is similar to the Patent and Trademark Office's requirement upon issuance of a patent for a cell or microorganism.

- 2. The recipient of protection should be required to retain a sample of the cell or microorganism for the duration of the protection period, but should be provided with the option of sharing the cell or microorganism with others for research purposes.

(It is unclear whether businesses would use a sui generis protection with a depository requirement. They may prefer trade secret or patent protection. Under 37 C.F.R. Part 211.5, the Copyright Office allows a semiconductor mask work registrant to block out material considered a trade secret, provided it is less than 50 percent of the total.)

Alternative Legislative Issues and Approaches for Stimulating the Transfer and Use of Federal Computer Software and Semiconductor Mask Works[1]

What legislative alternatives exist for providing copyright authority?

- 1. Almost all of the federal patent attorneys supported amending 17 U.S.C. 105 to permit federal agencies to copyright computer software. Coverage could include:

  a. All federal computer software.

  b. Computer software if the head of the agency determines, on a case-by-case basis, that copyright protection will (1) stimulate the software's transfer to and use by businesses or other organizations in the United States, (2) facilitate public access to the software, or (3) further the agency's mission to improve public health and safety.

- 2. Some federal patent attorneys supported amending the Federal Technology Transfer Act (15 U.S.C. 3710a) to allow agencies to copyright and license software that is part of cooperative R&D agreements.

Should federal agencies copyright supporting documentation for computer programs?

- 1. Limit authority to computer programs. Under 17 U.S.C. 101, a computer program is defined as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result." This definition does not include data bases or documentation such as users manuals.
- 2. Some patent counsels supported allowing federal agencies to copyright computer programs and associated documentation, suggesting as an example an interagency committee's proposed definition for the Federal Acquisition Regulation:

  Computer programs, computer program documentation, and any other data that would enable a computer program to be recreated, reproduced, or recompiled. The term does not include computer data bases.

If Title 17 is amended, what other authorities should be considered?

- 1. Amend 17 U.S.C. 903 to allow federal agencies to protect federal semiconductor mask works.

[1]Attorneys who are responsible for intellectual property protection at seven federal agencies identified these alternative legislative approaches and issues.

- 2. Conform 17 U.S.C. 105 and 903 with provisions of 35 U.S.C. 207-209

  a. Provide authority for federal agencies to issue exclusive, partially exclusive, or nonexclusive licenses, including the grant to the licensee of the right of enforcement.

  b. Provide protection of the government's and the public's interests, particularly by requiring (1) agencies to publicly advertise the availability of copyrights for licensing, (2) a plan for development and/or marketing the software or semiconductor mask works, (3) periodic utilization reports, and (4) an agency's right to terminate the license.

  (The government's rights to any derivative works that the licensee develops would be subject to agencies' implementing regulations and/or negotiation of the licensing agreement.)

- 3. Address the relationship of the copyright amendments with the Freedom of Information Act.

  a. Permit federal software and semiconductor mask works to be subject to a Freedom of Information Act request. The licensee would use the copyright protection to prevent competitors from marketing the software.

  b. Exclude from a Freedom of Information Act request software and semiconductor mask works that are licensed on either an exclusive or partially exclusive basis or for which a license is being negotiated.

- 4. Address the federal agency's vs. the employee author's right to the copyright title either in legislation or an Executive Order.

  a. Provide rights in accordance with the copyright act's definition of a "work of the U.S. government," which is defined as one prepared by an officer or employee of the government as part of that person's official duties.

  b. Provide rights that are similar to those for inventions. Executive Order 10096 defines in detail the government's rights to inventions made by federal employees.

- 5. Consider whether to extend the provisions of 35 U.S.C. 200-204, 206, and 210 to copyrightable technologies. Under the Federal Acquisition Regulation for civilian agencies, contractors must request a waiver of

title from the funding agency for data, including software and semiconductor mask works.

a. 35 U.S.C. 202 permits nonprofit and small business contractors and grantees to elect to retain title to subject inventions. Consider whether this election should be extended to (1) any software and/or semiconductor mask works or (2) software or mask works that the contractor determines would have commercial potential. In addition or alternatively, consider whether this technology should revert back to the federal agency after a specified period of time (2 to 5 years) for public dissemination if it is not licensed or otherwise commercialized. (Agencies could be permitted to waive reversion if the contractor is taking adequate steps to commercialize the technology.)

b. 35 U.S.C. 202(c)(4) provides for the government's royalty-free license.

c. 35 U.S.C. 203 provides for government march-in rights.

d. 35 U.S.C. 204 provides a preference for U.S. industry.

e. 35 U.S.C. 206 provides for uniform clauses and regulations.

f. Provide a precedence of chapter section similar to 35 U.S.C. 210.

- 6. Amend 17 U.S.C. 403 to exclude any software for which a government agency obtains a copyright. The section requires publications that bear a notice of copyright to identify any portions of the work that incorporate U.S. government works.

Should royalty sharing be extended to federal employees who develop software or semiconductor mask works that are commercialized?

- 1. Almost all of the federal officials we interviewed support amending 15 U.S.C. 3710c to include federal employees who developed software.
- 2. Royalty-sharing authority could also be extended to federal employees who develop semiconductor mask works.

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